Health Policy and Technology (2016) 5, 243–250

Available online at www.sciencedirect.com

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journal homepage: www.elsevier.com/locate/hlpt

Medical Technologies Evaluation Programme: A review of NICE progression decisions, 2010–2013

Kim Keltie*, **Derek R Bousfield, Helen Cole, Andrew J Sims**

Medical Physics Department, Freeman Hospital, Newcastle upon Tyne Hospitals NHS Foundation Trust, NE7 7DN, England, UK

Available online 1 April 2016

KEYWORDS
NICE;
Technology adoption;
Healthcare innovation;
Review

Abstract
Objectives: To review the progression decisions for notifications considered at National Institute of Health and Care Excellence (NICE) Medical Technology Advisory Committee (MTAC) meetings during its first three years (2010–2013) to identify trends.
Methods: The list of medical devices discussed at committee, briefing notes, committee decisions, and non-progression letters, where applicable, were obtained from NICE. Each medical device presented to committee was classified using five different medical device categorisation systems. Trends in progression decision, scores against programme selection criteria over time, and reasons provided by committee to support the non-progression decision, were analysed.
Results: Between January 2010 and March 2013 31 MTAC meetings were held. Of the 110 medical technologies considered, 45 were given a progression decision (23 selected for Medical Technologies Guidance development, 22 routed for guidance development in other NICE programmes), 64 did not progress to guidance development and 1 was excluded from analysis whilst awaiting final committee decision. The six programme categories and total scores were not sensitive or specific predictors of progression to guidance decision. No significant change in the proportion selected for progression over time was observed ($P>0.05$). No compelling evidence of an association between the type of medical device and progression decision was found. Fifteen distinct reasons for non-progression were identified; 'lack of evidence' being provided in the majority, 93.8%, of cases.

*Correspondence to: Northern Medical Physics and Clinical Engineering, Freeman Road, High Heaton, Newcastle upon Tyne, NE7 7DN. Tel.: +44191 213 8636.
E-mail address: kim.keltie@nuth.nhs.uk (K. Keltie).

http://dx.doi.org/10.1016/j.hlpt.2016.03.003

Conclusions: During its first three years, MTAC's progression decisions for guidance development on medical technologies were not associated with device type and there is no evidence of changes over time.

Introduction

The Medical Technologies Evaluation Programme (MTEP) was established by NICE in 2009 [1] to identify and encourage the adoption of novel medical technologies through the development of national guidance [2,3]. According to the MTEP processes and methods guides [4,5], manufacturers or suppliers (sponsors) of technologies initiate the process by submitting a notification form to NICE. For each notified medical device, the NICE MTEP team prepares a briefing note [4] consisting of information drawn from the sponsor's notification form, background information and expert advice, then assigns a score based on the extent to which the technology meets the programme selection criteria [5]. The briefing note is considered by the Medical Technologies Advisory Committee (MTAC) where it is discussed with expert advisors during a closed meeting, from which members of the public and sponsors are excluded. The committee first decides whether the technology should progress to full guidance or not. For technologies recommended to progress, MTAC then recommend whether to select the device for Medical Technologies Guidance (MTG) development on the basis of its claims and supporting evidence, or whether to route it to another NICE programme for guidance development. A review of the Medical Technologies Evaluation Programme has recently been published by Green and Hutton [6].

Sponsors of topics which MTAC have decided not to progress to guidance development in any NICE programme receive a commercial-in-confidence letter from the Committee chair summarising the committee's considerations with reference to the selection criteria. The letter may suggest refinement of the case for adoption or request development of further evidence (*e.g.* for a particular clinical indication), and offers sponsors the opportunity to contact NICE for more information on the decision. Unless the sponsor contacts NICE, which might include seeking advice on re-notification, NICE does not routinely follow up topics given a non-progression decision.

NICE publishes details of all technologies considered by MTAC [7], including those not progressed further for guidance development, although some authors [3] have noted that the reasons for non-progression are not put into the public domain. Although this is to avoid potentially discouraging companies from submitting to the programme, it could be interpreted as a lack of transparency. This provides the motivations for the aims of this study, which are to identify the factors which most strongly influence MTAC in deciding whether or not to progress a particular technology for full guidance development, and to establish whether MTAC's decisions are associated with the characteristics of technologies. The objectives of this study are to review the progression decisions for notifications considered at MTAC meetings during its first three years (2010–2013); to identify any trends in progression rate and scores against programme selection criteria over time (a possible learning curve effect); to classify the types of medical technology presented to committee; to test for association between the characteristics of technology and progression decision, and to summarise the reasons provided by committee to support their non-progression decisions.

Methods

Publicly available minutes from committee meetings were obtained for the period January 2010 to March 2013 from the NICE website [7]. A spreadsheet was compiled of all medical technologies submitted during this time. Corresponding briefing notes and non-progression letters, if applicable, were provided by NICE to the authors in confidence.

The total numbers of medical technologies considered, the number progressing to full guidance development (either for MTG development or routed to other NICE programmes) and those not progressing to guidance at each committee meeting between January 2010 and March 2013 (inclusive) were assessed from the minutes. Trends (*i.e.* presence of a learning curve effect) were assessed by converting committee meeting dates (when the final progression decision was made) to integer days counted from the first committee meeting. The correlation between time (in days) and the proportion selected for progression was analysed using Pearson's product-moment correlation [8]. Scripts for data manipulation and statistical analysis were written in the statistical programming language R (version 3.2.3, R Foundation for Statistical Computing) [9].

Scores assigned by the MTEP team were extracted from briefing notes. Each criterion is scored on a scale from 1 to 5, where 1 is the worst score and 5 is the best [5]. For example, a score of 1 for claimed additional benefit to patients implies the technology is of negligible additional benefit compared with existing standard care; a score of 5 implies the technology is of significant additional diagnostic or therapeutic benefit compared with existing standard care. For the cost criterion, a score of 1 indicates that the costs are low and a score of 5 indicates that the costs are high. In order to match the sense of the other criteria, the cost score was inverted for analysis and a total score was calculated for each device.

The distribution of scores was initially tested using the Shapiro–Wilk test for normality [10], with significant deviation from normal distribution identified when $P<0.1$ [11]. Total scores and scores for each of the five criteria for all

technologies considered were compared univariately (against the null hypothesis of no difference between those selected for progression and those not) using non-parametric Mann–Whitney *U*-tests [12]. In addition, the effect sizes of the five individual criteria scores on the decision to progress were estimated using multivariate binary logistic regression analysis with a generalised linear model [13]. Coefficients of the independent predictor variables were expressed as odds ratios (with corresponding 95% confidence intervals) which can be interpreted as the increase in odds of being selected for progression given a one point increase in each individual score.

Briefing notes were analysed independently by two reviewers and arbitrated by a third, to classify each medical device presented at committee by the device type using five distinct medical device categorisation systems. The Global Medical Device Nomenclature (GMDN) [14] and European Council (EC) Directive [15] classify by the primary mode of action of the technology; the British National Formulary (BNF) [16] classifies by body system, and the Food and Drug Administration (FDA) medical specialty panel [17] and intended use (dichotomised as diagnostic/therapeutic) classifies by medical speciality. Associations between each device classification (using the five described systems) and the committee decision (*i.e.* progression to guidance or no progression), were assessed by Fisher's Exact test, generalised for $r \times 2$ contingency tables [18]. A significance level of 5% was used for all statistical analysis (*i.e.* null hypothesis rejected when $P<0.05$).

Committee non-progression letters were reviewed independently by two reviewers and arbitrated by a third, to identify the common reasons and their frequency of occurrence. Reasons provided by committee for non-progression were then matched to one or more programme selection criteria defined in the MTEP Methods Guide [4]. Analysis of association between the device categories and each individual reason for non-progression was also conducted via Fisher's Exact tests. To take into account the number of univariate test comparisons being applied (*i.e.* separate analysis for each reason given for non-progression), Bonferroni correction was applied to the significance level [19].

Results

During the period of January 2010–March 2013, there were 31 committee meetings of which 29 included consideration of a total of 110 different medical technologies. No medical devices were re-notified after non-progression during this period. The majority of sponsors (107/110, 97.3%) were either the manufacturer or supplier of the medical technology; three (2.7%) were sponsored by NHS professionals.

The median number of medical devices considered at individual committee meetings was 4 [range 1–6]. A non-significant negative correlation (*i.e.* reduction) in the number of medical devices considered at committee over the 1155 days between the first committee meeting on the 21st January 2010 and the 31st meeting on 21st March 2013 was observed using Pearson's correlation test, $r=-0.22$ [95% CI -0.54 to 0.16].

Of the 110 medical devices reviewed by committee, 45 progressed to full guidance (23 (20.9%) were selected for MTG and 22 (20.0%) were routed for consideration for other NICE programmes which included 19 to the diagnostics programme, one to the interventional procedure programme, one to clinical guidelines and one to technology appraisal [20]) and 64 (58.2%) did not progress to guidance development. A final decision was not given for one product (0.9%) at the time of analysis and therefore was excluded from analysis. Figure 1 shows the cumulative 'progression to MTG', 'progression to guidance in other NICE programmes', 'not for progression to guidance' committee decisions made during the three year period of interest.

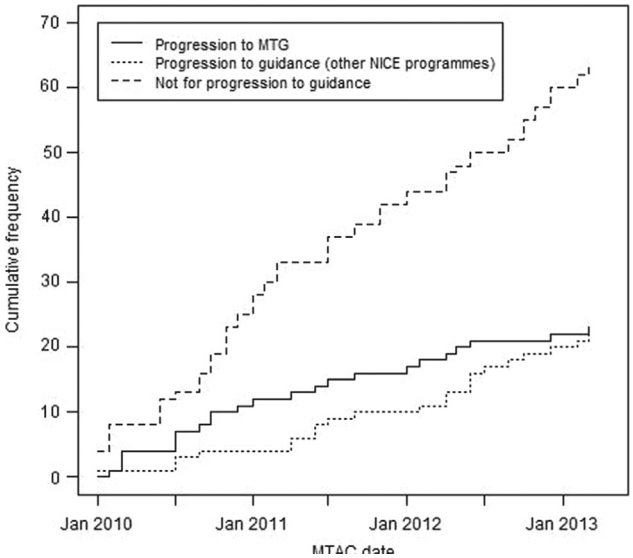

Figure 1 Cumulative frequency of Medical Technology Advisory Committee decisions: progression to Medical Technologies Guidance (MTG) development (solid line), progression to guidance in other NICE programmes (dotted line) and those not for progression to guidance in any NICE programme (dashed line).

During meetings held between January 2010 and March 2013, no significant correlation was found between the proportion progressing to guidance and time using Pearson's correlation test, $r=0.07$ [95% CI -0.30 to 0.43].

The scoring of medical devices by the NICE technical team during the preparation of the briefing note was not introduced until April 2011, therefore only 56 (50%) of the 110 medical devices presented at committee during the period of interest had briefing note scores completed; scores for 10 medical devices progressing to MTG development, 16 progressing to guidance development in other programmes and 30 not progressing to guidance were available for analysis. The median [range] total score for medical devices selected for progression to guidance development was 19 [16,24] and 18 [13,22] for those not progressing, $P=0.53$ (Table 1).

For three of the six selection criteria scores, there was weak evidence to reject the null hypothesis of no difference (between devices selected for progression versus those not), but there was no evidence of any differences from multivariate analysis (*i.e.* the 95% CI of all odds ratios included 1.0), Table 1.

There was a significant association between BNF category and committee progression decision ($P=0.02$), Table 2,

most likely due to the committee progressing 15/24 (62.5%) of cardiovascular devices, compared with the overall progression rate of 41%. There were no significant associations between GMDN category, primary intended use, EC classification or FDA medical specialty panel and committee progression decision, Supplementary online material 1.

Table 1 Results of univariate and multivariate analysis between medical devices progressing and those not progressing to NICE guidance development. Odds ratios are the increase in odds of being selected for progression for a one point increase in score.

Score compared	Univariate Mann–Whitney *P*-value	Multivariate Odds ratio (95% CI)
Total	0.53	-
Patient benefit	0.05	1.81 (0.72:5.00)
Healthcare system benefit	0.05	1.74 (0.64:5.09)
Patient population	0.52	0.88 (0.51:1.51)
Disease impact	0.04	1.91 (0.82:4.89)
Cost	0.28	0.85 (0.47:1.51)
Sustainability	0.45	1.34 (0.67:2.76)

Table 3 Reasons for a non-progression decision.

Reason for non-progression decision	Frequency *n* (%)
Lack of evidence	60 (93.8)
Insufficient or uncertain benefit to NHS	37 (57.8)
Insufficient or uncertain benefit to patient	28 (43.8)
Uncertain or no cost benefit	16 (25.0)
Not novel	16 (25.0)
Not clear how technology would be used in NHS	9 (14.1)
Wrong comparator	9 (14.1)
Lack of plausible promise	9 (14.1)
Usability or technology design issue	8 (12.5)
Design appropriate only to a small population	6 (9.4)
Inappropriate clinical assumptions	4 (6.2)
Insufficient demand	3 (4.7)
Evidence does not translate to UK setting	3 (4.7)
Incorrect costing assumptions	3 (4.7)
Potential equality impact issue	3 (4.7)
Total	214

Table 2 Classification of medical devices progressing and not progressing to NICE guidance development by British National Formulary (BNF) device category.

BNF section category	Progression (to MTG)	Progression (to other NICE programmes)	Not for progression	Total
Cardiovascular	11	4	9	24
Malignant disease and immunosuppression	1	7	12	20
Wound management product	3	0	6	9
Musculoskeletal and joint disease	2	1	6	9
Obstetrics, gynaecology and urinary-tract disorders	0	0	5	5
Skin	2	0	3	5
Central nervous system	0	0	4	4
Ear, nose and oropharynx	0	0	4	4
Eye	0	0	3	3
Respiratory	1	3	2	6
Endocrine	0	0	2	2
Infections	0	0	2	2
Nutrition and blood	0	1	2	3
Pregnancy	1	0	1	2
Renal impairment	1	0	1	2
Anaesthesia	0	1	1	2
Immunological products and vaccines	1	0	0	1
Interactions	0	0	1	1
Gastro-intestinal	0	4	0	4
Liver disease	0	1	0	1
Breast-feeding	0	0	0	0
Intravenous additives	0	0	0	0
Borderline substances	0	0	0	0
Total	23	22	64	109

Table 4 Classification by U.S. Food & Drug Administration (FDA) device category grouped by reasons for non-progression (*P < 0.003).

		Reasons for non-progression **[R3.7]**														
	Category	Lack of evidence	Insufficient or uncertain benefit to NHS	Insufficient or uncertain benefit to patient	Uncertain or no cost benefit	Not novel	Not clear how technology would be used in NHS	Wrong comparator	Lack of plausible promise	Usability or technology design issue	Design appropriate only to a small population	Inappropriate clinical assumptions	Insufficient demand	Evidence does not translate to UK setting	Incorrect costing assumptions	Potential equality impact issue
FDA panel category	Anaesthesiology	5	2	1	3	2	0	1	0	1	0	1	0	1	0	1
	Cardiovascular	7	4	2	2	3	1	1	1	1	0	0	0	0	1	0
	Clinical chemistry and clinical toxicology	2	1	2	1	0	1	0	1	0	0	0	1	0	0	0
	Ear, nose and throat	3	2	1	0	2	0	1	0	0	0	0	0	0	0	0
	Gastroenterology-urology	2	0	2	1	1	0	0	2	0	0	1	0	1	0	0
	General and plastic surgery	7	7	8	0	1	1	3	1	0	0	1	0	0	1	0
	General hospital and personal use	5	4	4	2	1	0	0	1	2	0	1	0	0	0	1
	Haematology and pathology	6	5	1	0	1	1	0	0	0	1	0	0	1	0	0
	Immunology and microbiology	2	2	2	1	0	0	0	0	1	0	0	0	0	0	0
	Neurological	3	1	1	0	2	2	0	0	1	0	0	0	0	1	0
	Obstetrical and gynaecological	4	3	2	1	0	1	1	1	1	1	0	0	0	0	0
	Ophthalmic	3	0	1	0	2	0	0	0	0	1	0	2	0	0	0
	Orthopaedic	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0
	Physical medicine	6	2	0	2	0	2	1	2	1	1	0	0	0	0	1
	Radiology	4	4	1	3	1	0	0	0	0	1	0	0	0	0	0
	Total	60	37	28	16	16	9	9	9	8	6	4	3	3	3	3
	Fisher's P-value	0.64	0.05	0.00*	0.10	0.26	0.56	0.43	0.46	0.45	0.21	0.71	0.01	0.57	0.83	0.75

Fifteen distinct reasons for non-progression were identified from the commercial in confidence letters provided by NICE to sponsors of topics not progressing to guidance development, Table 3. The majority of letters (62/64, 96.9%) contained more than 1 reason for non-progression, ranging from 1 to 6, with the median number of reasons being 3.

Grouping the reasons for non-progression into the Programme's published selection criteria (Supplementary online material 2) required further sub-grouping; the majority (52/60, 86.7%) related to the sponsor notification inadequately demonstrating the medical device's clinical effectiveness, and 31/60 (51.7%) and 29/60 (48.3%) related to insufficient cost evidence and insufficient technical evidence respectively. A significant association was found between FDA categories and 'insufficient or uncertain benefit to patient reason' (n=28, P=0.00) reason for non-progression, Table 4 (i.e. medical devices in some FDA categories were more likely to obtain this specific reason for non-progression than other FDA categories). No other significant associations between medical device categories and reasons for non-progression were found, see Supplementary material online 3.

Discussion

Of the 110 medical technologies considered by the Medical Technologies Advisory Committee during its first three years, approximately one fifth (n=23, 20.9%) were given a progression decision to Medical Technologies Guidance, and a similar proportion (n=22, 20.0%) were given a progression decision to other NICE programmes. The rates of submission to MTEP and proportion selected for progression to guidance have not changed over time.

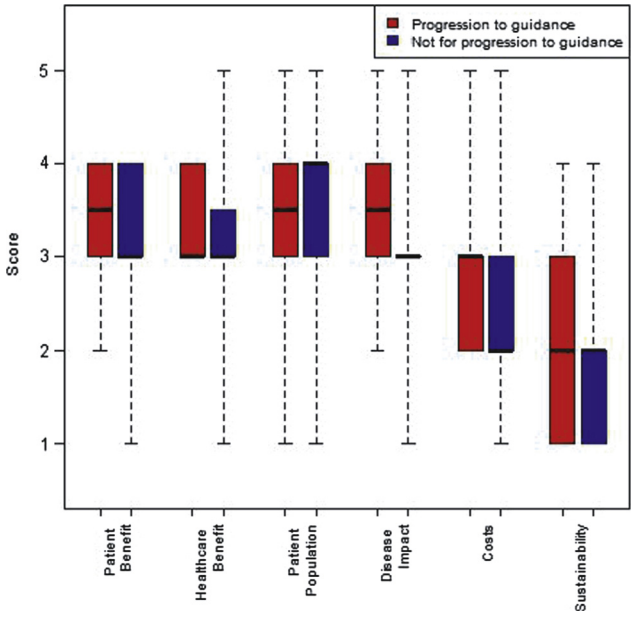

Figure 2 Boxplots showing distribution in individual scores between medical devices given progression to guidance development (red) and not for progression to guidance (blue) decisions. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

The MTEP team introduced a scoring system to inform committee deliberations. However, we found that the total score or the scores for any of the six programme categories (Figure 2) were not associated with decision to progress to guidance. A limitation of this result is that scores were available for only half the technologies considered by committee. Noting this limitation, we speculate that briefing note scores are actually an indication of an innovative device's '*potential impact*' in the NHS, allocated before the evidence is appraised, and that scores correlate poorly with progression decisions because lack of evidence is the most common reason cited for non-progression by the committee. The addition of a criterion to reflect the level and quality of available evidence may help improve the value of the scoring exercise and lead to reduced decision times by the committee.

Application of five internationally recognised medical device categorisation systems to all 110 medical devices required independent analysis by two reviewers, arbitration by a third, and where necessary, the application of additional rules to ensure that each device was described by a single category within each system. The difficulty experienced in applying medical device categorisation in this study highlights that no single medical device categorisation system is capable of capturing the purpose, primary mode of action and anatomical location of use of a medical device. We found a significant relationship between progression decision and one of the categories (BNF)-due to a slight tendency to progress cardiovascular devices more often than others- but found no similar associations with any of the other categorisations studied, including FDA panel categories which also includes a cardiovascular category. Therefore there is little evidence to suggest that the committee favours or disfavours any particular type of device when deciding if it should progress to guidance.

The committee provided 15 distinct reasons for non-progression to the 64 medical devices not selected for progression to guidance development, the median number of reasons provided in each non-progression letter was three with 'lack of evidence' being provided in almost all (93.8%) cases. Thematic analysis of the non-progression letters provided by NICE to the sponsors of medical devices had two main limitations: firstly, we had to assume that the reasons for no progression were captured accurately in the letters and secondly that there is some scope for interpreting programme selection criteria as overlapping (*e.g.* claimed healthcare system benefit and cost considerations). Although it should be considered in the light of these limitations, we found no significant associations between reasons given for non-progression and the six programme selection criteria. In addition, very few not-for-progression reasons were related to patient population and none were directly related to sustainability. Using focus groups, Sprange and Clift [21] found that manufacturers perceived the publication of negative guidance from NICE as a risk. Although decision of non-progression to NICE guidance is not the same as negative guidance, publication of information about devices not progressing to guidance may also be perceived as a risk by companies and therefore discourage new and repeat submissions. In fact, 'lack of evidence', rather than an absence of

plausible promise, was the main reason for non-progression, but in the early years of the programme, NICE had to trade off the benefits of full disclosure against the risk of discouraging new and repeat submissions from companies which would be contrary to the aims of the programme – to encourage adoption of novel technologies. Our study, using material provided directly by NICE, as well as material in the public domain, has helped to address the question of potential lack of disclosure of NICE's processes.

No significant correlations were found between individual reasons for non-progression and time, or device categorisations (using GMDN, BNF, Intended use, EC Directive and FDA categorisation methods) and time. One significant association was found between FDA category and the "insufficient or uncertain benefit to patient" reason for non-progression, even after multiple testing had been accounted for, suggesting weak evidence that there are some categories of device for which this is reason is given more often than expected by chance.

We have conducted an extensive analysis of the process by which MTAC decide to progress or not progress medical technologies for guidance development during the period 2010–2013. We found no evidence of bias towards particular types of device in the committee's deliberation process. A lack of evidence was by far the most common reason given for non-progression, including for some technologies considered to be of potential benefit to the NHS. This suggests that further investment may be justified in infrastructure which permits companies to work with the NHS to further develop their evidence base.

As the development and market growth of medical devices accelerates, so too must the evaluation process applied by MTEP. This study found that a median of four medical devices were evaluated by MTAC each month, and that only one in five received recommendation for MTG development, and another one in five received recommendation for guidance development in other NICE programmes (*e.g.* Diagnostic Guidance). This suggests that further work is needed to encourage manufacturer submission of medical devices to the correct NICE programme and to quicken the evaluation process.

Author statements

Funding

This work was supported by the UK National Institute for Health and Care Excellence (NICE). The authors' employing institution is contracted as External Assessment Centre to the NICE Medical Technologies Evaluation Programme (MTEP).

Competing interests

None declared.

Ethical approval

Not required.

Acknowledgements

The authors' employing institution is contracted as an External Assessment Centre to the UK National Institute for Health and Care Excellence (NICE) Medical Technologies Evaluation Programme (MTEP).

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.hlpt.2016.03.003.

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